

REMARKS/ARGUMENTS

Consideration of the above-identified application in view of the present amendment is respectfully requested. By the present amendment, claims 23-25 are added. Claims 1-5, 9-20, and 22-25 are pending in the application.

Claims 1 and 10 stand rejected under 35 U.S.C. §102(b) as being anticipated by US 6,309,259 B1 (Yamashita), and claims 1-5, 9, 11-19, and 22 stand rejected under 35 U.S.C. §103(a) as being unpatentable over US 5,038,252 (Johnson) in view of US 5,823,830 (Wurster). Applicant respectfully submits that claims 1-5, 9, 10-19, and 22 are patentable over these references.

Claim 1 recites that the pin includes beam portions defined by inner surfaces consisting essentially of a plurality of blended cylindrical surfaces. The beam portions include respective interface portions having cylindrical inner and outer surfaces. The inner and outer surfaces of the interface portions are convex and face away from each other. The interface portions have a cross-sectional area that is greater than a cross-sectional area of the remainder of the beam portions. This is not taught or suggested in the references cited in the Office Action.

Anticipation requires the disclosure in a single prior art reference of each element of the claim under consideration. W.L. Gore & Assocs. v. Garlock, Inc., 721 F.2d 1540, 220 USPQ 303, 313 (Fed. Cir. 1983). Clearly, Yamashita does not discloses each and every element of claim 1.

Specifically, in Yamashita, the opening 14s does not consist essentially of a plurality of blended cylindrical surfaces.

In particular, each of the cylindrical surfaces in the present invention is defined as having a radius and a length. The radius and length of each cylindrical surface is blended with its adjacent cylindrical surfaces. By blended, it is meant that the inner surfaces are formed in their entirety by cylindrical surfaces. The transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials or steps and those that do not materially affect the basic and novel characteristic(s) of the claimed invention. In re Herz, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976).

This feature recited in claim 1 provides advantages not disclosed or realized in the prior art. The configuration of the beam portions, having the contoured configuration defined by the blended radii of the opening and the cylindrical outer surfaces, helps spread out the stress uniformly over the interface portions. This configuration helps avoid the formation of sharp corners or intersections in the beam risers that may act as stress risers. This configuration helps prevent overstressing the beam portions, which could result in part failure, and also helps prevent plastic deformation of the beam portions, which could result in a reduced retention force.

As clearly seen in Fig. 2 of Yamashita, the opening 14s includes non-cylindrical (flat) surfaces that extend tangentially from the top portion of the opening. These flat surfaces do not have a radius and a length. Thus, the

surfaces of the opening 14s are not formed in their entirety by cylindrical surfaces.

Yamashita also does not disclose inner and outer surfaces of the interface portions 14 that are convex and face away from each other. Further, the interface portions in Yamashita do not have a cross-sectional area greater than the remainder of the beam portions. The beam portions appear to have a uniform cross-sectional area. Because the interface portions in the present invention have this relatively large cross-sectional area, the beam portions are strengthened and stiffened in the area of the interface portions. This helps increase the resilience of the beam portions, which increases the frictional engagement between the interface portions and the side wall and thus helps increase the retention force exhibited by the contact when the contact is fully inserted in the through-hole. By contrast, Yamashita has a removal resistance portion 15 located immediately below the elastic contact part that retains the contact to the substrate prevents accidental pull-out of the terminal from the substrate. In fact, the above mentioned issues related to the interface portions were not address in this rejection of claim 1 as being anticipated by the Yamashita reference. Therefore, due to the above mentioned reasons, claim 1 is not anticipated by Yamashita.

Regarding the rejection of claims 1-5, 9, 11-19, and 22 under 35 U.S.C. §103(a) as being unpatentable over Johnson in view of Wurster, this rejection should also be overcome due to the following reasons. To establish a claim of obviousness,

there must be some suggestion or motivation to a person having ordinary skill in the art to modify the reference or to combine reference teachings (MPEP §706.02(j)). The factual inquiry whether to combine references "must be based on objective evidence of record." In re Sang-Su Lee, 277 F.3d 1338, 1343 (Fed. Circ. 2002). As stated recently by the Federal Circuit:

[A] rejection cannot be predicated on the mere identification of individual components of claimed limitations. Rather, particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the matter claimed.

It is not obvious to modify Johnson in view of Wurster to provide a compliant pin as recited in claim 1. Neither Johnson nor Wurster nor any other reference disclose that both of the inner and outer surfaces of their respective interface portions are convex and face away from each other. By contrast, in Johnson, the outer surfaces are flat, and in Wurster, the inner surfaces are concave.

Also, Johnson does not disclose that the opening in the pin 38 consist essentially of a plurality of blended cylindrical surfaces. As seen in Fig. 1 of Johnson, when the pin 38 is inserted in the counterbore 32, the right inner surface and the lower surface of the pin opening intersect at a sharp corner. Johnson does not disclose the configuration of the pin opening when the pin is out of the counterbore 32. In fact, Johnson does not disclose that the inner surfaces are convex when the pin is out of the counterbore 32.

Further, there is no suggestion or motivation to combine the teachings of Johnson and Wurster. It appears that the

examiner has used the claimed invention as an instruction manual or "template" to piece together teachings of the prior art, which is impermissible. In re Fritch, 972 F.2d 1260 23 USPQ2d 1780, 1784 (Fed. Cir. 1992). For these reasons, it is respectfully submitted that the rejections of claim 1 should be withdrawn and claim 1 should be allowed.

Claim 10, which depends from claim 1, should be allowed for the same reasons as claim 1 and also for the additional feature that the compliant pin comprises a positioning portion comprising first and second leg portions positioned on laterally opposite sides of the portion. Each of the legs have a surface for engaging a surface of the printed circuit board adjacent the through-hole and limiting insertion of the portion in the through-hole to help place the portion at a predetermined axial position in the through-hole. None of the other prior art, either alone or in combination, disclose or suggest this feature and including all of the limitations of claim 1. Therefore, claim 10 is allowable.

Claims 2-5, and 9 depend from claim 1 and are therefore allowable as depending from an allowable claim and for the specific features recited therein.

Regarding the rejection of claims 2 and 11, it is known that numerical ranges recited in claims can support nonobviousness and patentability. In re Glaug, 283 F.3d 1335, 62 USPQ2d 1151 (Fed. Cir. 2002). Also, applicant respectfully submits that claims 2 and 11 recite more than a mere variation in dimension and do, in fact, recite a device that performs differently from the prior art. The different dimension leads

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to substantially improved unexpected results and thus should be nonobvious. In re Soni, 54 F.3d 746, 34 USPQ2d 1684 (Fed. Cir. 1995).

In particular, claims 2 and 11 recite that the frictional engagement provides a retention force of at least 4 pounds and that the portion has a thickness of no greater than 0.4 millimeters. As described in the specification, the novel structure of the pin, having the blended cylindrical surfaces and the large cross-sectional area interface portions, allows an unexpected high retention force to be achieved with a thin pin. None of the prior art in the Office Action discloses a pin that is up to 0.4 millimeters thick while providing a retention force of at least 4 pounds.

For these reasons, it is respectfully submitted that claim 2 is allowable for these further reasons. It is also submitted that the rejection of claim 11 should be withdrawn and claim 11 should be allowed. Claims 12-19, and 22 depend from claim 11 and are therefore allowable as depending from an allowable claim for the specific features recited therein.

Claim 20, which depends from claim 11, should be allowed for the same reasons as claim 11 and also for the additional feature that the compliant pin comprises a positioning portion comprising first and second leg portions positioned on laterally opposite sides of the portion. Each of the legs have a surface for engaging a surface of the printed circuit board adjacent the through-hole and limiting insertion of the portion in the through-hole to help place the portion at a predetermined axial position in the through-hole. None of the

other prior art, either alone or in combination, disclose or suggest this feature and including all of the limitations of claim 11. Therefore, claim 20 is allowable.

Regarding the rejection of claims 10 and 20 under 35 U.S.C. §103(a) as being unpatentable over Johnson in view of Wurster as in claims 1 and 11 and in view of Yamashita, claims 10 and 20 are allowable for the previously mentioned reasons and also because there is no suggestion or motivation to combine the teachings of Johnson, Wurster, and Yamashita.

New claim 23 recites a compliant pin adapted to be pressed into a through-hole of a printed circuit board and have electrical contact with opposing surfaces of a side wall of the through-hole. The compliant pin comprises a portion insertable in the through-hole. The portion comprises spaced deflectable beam portions. Each beam portion includes an interface portion having a cylindrical outer surface. The outer surfaces of the interface portions being spaced apart a distance greater than the spacing of the opposing surfaces of the side wall. The outer surfaces engage the side wall and the beam portions deflect toward each other when the portion is inserted in the through-hole.

The interface portions frictionally engage the side wall and provide a retention force for retaining the portion in the through-hole. The portion comprises an opening extending through the portion and define inner surfaces of the beam portions. The inner surfaces consist essentially of a plurality of blended cylindrical surfaces. The interface portions each include a cylindrical inner surface comprising a

portion of the inner surface of its respective beam portion. The inner surface and outer surface of each interface portion being convex and facing away from each other. The interface portions have a cross-sectional area that is greater than a cross-sectional area of a remainder of the beam portions, wherein the compliant pin extends completely through the through hole.

Neither Yamashita, nor Johnson, nor Wurster, nor any of the other prior art discloses or suggest the features of claim 23.

In Yamashita, the opening 14s does not consist essentially of a plurality of blended cylindrical surfaces.

As clearly seen in Fig. 2, the opening includes non-cylindrical (flat) surfaces that extend tangentially from the top portion of the opening. Yamashita also does not disclose inner and outer surfaces of the interface portions 14 that are convex and face away from each other. Further, the interface portions in Yamashita do not have a cross-sectional area greater than the remainder of the beam portions. The beam portions appear to have a uniform cross-sectional area.

In Johnson, the outer surfaces of the beam portions are flat rather than convex. Also, the pin 38 does not extend completely through the holes 32, 27 of the printed circuit board. By contrast, the pin 38 extends only through the counterbore 32, which only extends through the cap 14 of the printed circuit board. This permits a second hole 27 to have a much smaller diameter, since the second hole 27 does not have to receive the pin 38.

As mentioned in Johnson, the reduced size of the second hole 27 offers many several advantages. One advantage is that a greater number of traces may be placed between any particular pair of holes therein. Also, power and ground layers may have greater effective conductive width. Other advantages include the need for fewer levels of conductive paths, reduced capacitance, greater flexibility of trace path design, shorter trace paths (see col. 2, lines 46-55). In this respect, Johnson teaches away from having the compliant pin completely extending through the through hole of the printed circuit board because the second hole 27 cannot be reduced in size in order to receive the compliant pin.

In Wurster, the inner surfaces of the beam portions are concave rather than convex. Also, for a thick printed circuit board as shown in FIG. 5 of Wurster, Wurster states that the extreme lower end 32 of the compliant section does not project below the board lower face 34, which avoids crosstalk between adjacent contacts (see col. 3, lines 11-14). Thus, Wurster also teaches away from having the compliant pin completely extending through the through hole of the printed circuit board. Therefore, claim 23 is allowable.

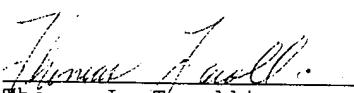
Claim 24, which depends from claim 23, should be allowed for the same reasons as claim 23 and also for the additional feature that the compliant pin extends through the through hole until the opening of the portion projects below the bottom of the printed circuit board. None of the prior art, either alone or in combination, disclose or suggest all of the features of claim 24. Thus, claim 24 is allowable.

Claim 25, which depends from claim 23, should be allowed for the same reasons as claim 23 and also for the additional features that the inner surfaces of the beam portions each include a central cylindrical surface. The central cylindrical surfaces being convex and presented facing each other and defining a central portion of the opening. None of the prior art, either alone or in combination, disclose or suggest all of the features of claim 25. Thus, claim 25 is allowable.

In view of the foregoing, it is respectfully submitted that the above identified application is in condition for allowance, and allowance of the above-identified application is respectfully requested.

Please charge any deficiency or credit any overpayment in the fees for this amendment to our Deposit Account No. 20-0090.

Respectfully submitted,

  
Thomas L. Tarolli  
Reg. No. 20,177

TAROLLI, SUNDHEIM, COVELL,  
& TUMMINO L.L.P.  
526 Superior Avenue - Suite 1111  
Cleveland, Ohio 44114-1400  
Phone: (216) 621-2234  
Fax: (216) 621-4072  
Customer No.: 26294